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New *Perdita (Perdita)* Oligoleges of *Mentzelia*, with Notes on Related Species of the *Ventralis* Group (Hymenoptera: Andrenidae)

TERRY L. GRISWOLD AND FRANK D. PARKER

USDA, ARS, Bee Biology & Systematics Laboratory, Utah State University, Logan, Utah 84322–5310

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Abstract.—Two new *Mentzelia* oligoleges of *Perdita (Perdita)* are described: *P. multiflorae* Parker from the San Rafael Desert of Utah and *P. kiowi* Griswold from the Great Plains. *P. viridinotata* Timberlake is synonymized with *P. wootonae* Cockerell. New distributional records are provided for *P. wootonae* and *P. holoxantha* Timberlake.

While conducting a survey of aculeate Hymenoptera in the San Rafael Desert of central Utah, the nest of a species of *Perdita* was discovered. This *Perdita*, which proved to be undescribed, was one of two species common on *Mentzelia* in the late afternoon when the flowers opened. Study of related species of *Perdita (Perdita)* of the *Ventralis* Group oligolectic on *Mentzelia* showed that there was a second undescribed species and a previously unrecognized synonymy. Here we describe these new species, give new records for closely related species, and present a key to the included forms.

The *Perdita* here discussed constitute a small assemblage of mostly pale *Perdita (Perdita)* of the *Ventralis* Group. In these species, the body color is largely pale yellow or off-white, with minimal dark markings. The scutum has, at most, weak dark marks laterally and the dorsum of the abdomen is either entirely light or with brownish markings restricted to the first two metasomal terga. Similarly colored species exist in the *Octomaculata* Group (*P. luteola* Cockerell, *P. xanthodes* Timberlake, *P. xanthochroa* Timberlake) and *Sphaeralceae* Group (*P. genalis* Timberlake, *P. luciae* Cockerell, *P. punctosignata* Cockerell, *P. stathamae* Timberlake, *P. triangulifera* Timberlake), but do not forage on *Mentzelia*. The species treated here differ morphologically from these similarly colored species as follows: *Ventralis* males have a distinct lateral furrow on the pronotal collar and a strong, laterally ridged pygidial region on tergum VII which is not scooped in lateral view. Male *Ventralis* further differ from *Octomaculata* males by their long scimitar-like mandibles which reach beyond the far lateral margin of the labrum, the

ventrally toothed or angled gena, the lateral brush of stout hair on sternum VI, and the entirely light hindtarsomeres II-V. *Ventralis* males differ from *Sphaeralceae* males in the apically pointed rather than truncate sternum VIII. Female *Ventralis* differ from females in the other groups by the presence of a distinct inner tooth on the mandible (may be absent in worn specimens) and by the presence of hooked hairs on the foretibia, at least basally. The pygidium of *Ventralis* females is straight with a truncate, unnotched apex while in *Octomaculata* females, the lateral margin is curved and the apex notched. The scopa on the hind tibia of *Ventralis* females is more dense on the outer and anterior surfaces than in *Sphaeralceae* females, with the hairs shorter and more strongly curved.

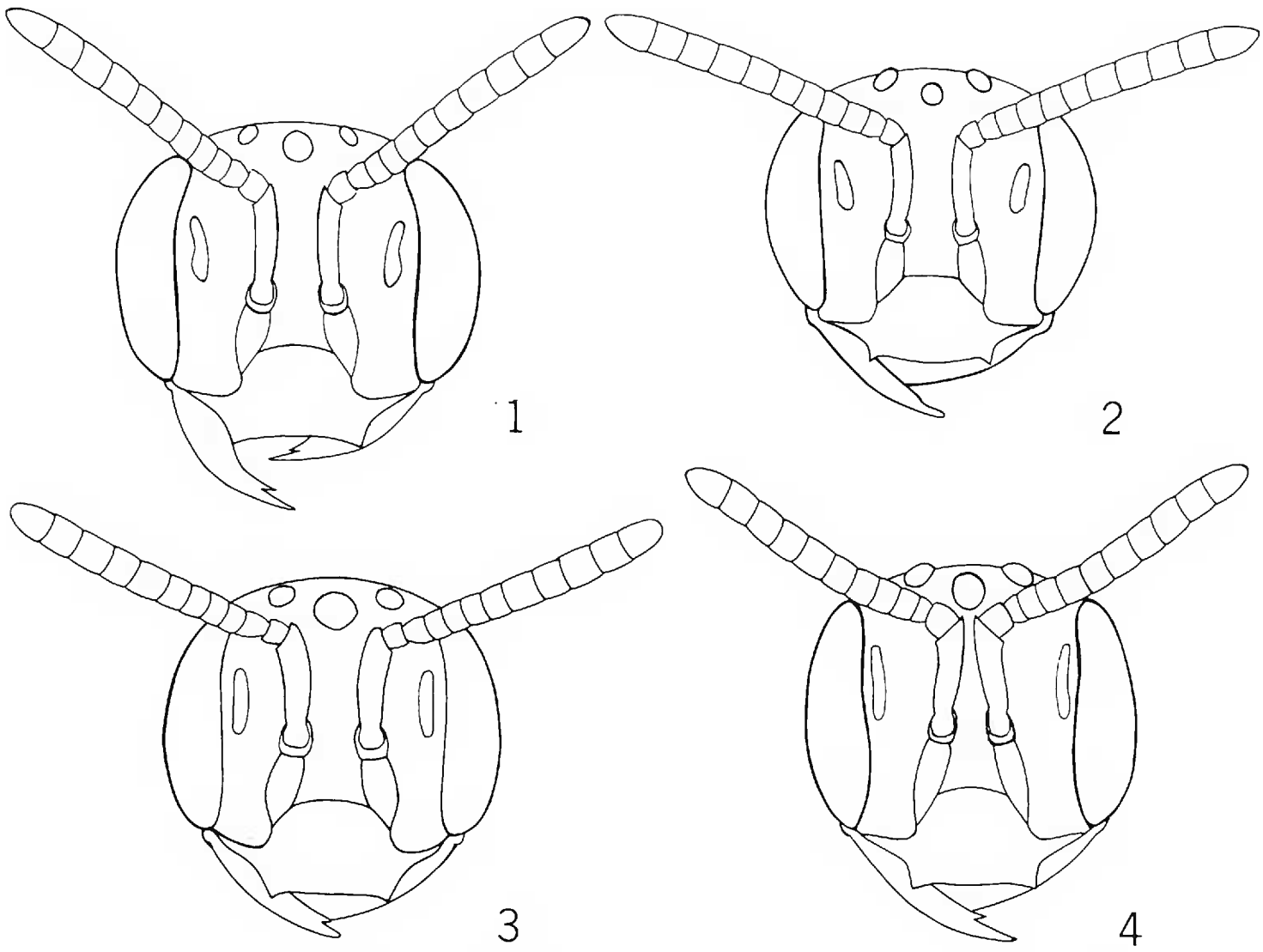
KEY TO INCLUDED SPECIES OF *Perdita*

Males

1. Sutures between scutum, scutellum, metanotum, and propodeum with dark markings, and/or propodeum with dark markings; hair of vertex and anterior part of scutum longer than pedicel 2
   Sutures between scutum, scutellum, metanotum, and propodeum without dark markings; propodeum without dark markings; hair of vertex and anterior part of scutum not longer than pedicel ..... *holoxantha* Timberlake
2. Dark markings present on tergum I; outer subantennal suture distinctly curved throughout except in macrocephalous individuals; lateral suture of clypeus just beneath juncture of outer subantennal suture oblique, forming low curve with rest of lateral suture; head length less than width 3
   Dark markings absent from tergum I; outer subantennal sutures straight except near juncture with clypeus; lateral suture of clypeus just beneath juncture of outer subantennal suture vertical, forming strong curve with rest of lateral suture; head length greater than or equal to width ..... *kiowi* Griswold
3. Mesopleuron ventrally with large metallic green spot; propodeal marks metallic ..... *wootonae* Cockerell
   Mesopleuron without ventral mark or with small brown non-metallic spot; propodeal marks non-metallic ..... *multiflorae* Parker

Females

1. Head width slightly greater than length (Figs. 1–3), face in part yellow; sutures between scutum, scutellum, metanotum, and propodeum without dark marks; post-axillary marks absent, or if present, brown not black 2
   Head length distinctly greater than width (Fig. 4), face off-white, without yellow areas; sutures between scutum, scutellum, metanotum, and propodeum with dark marks; black post-axillary marks present ..... *kiowi* Griswold
2. White on head restricted to clypeus. Mesopleuron without ventral mark or with submetallic brown spot 3
   Face at least white up to antennal base. Mesopleuron with metallic green ventral spot ..... *wootonae* Cockerell
3. Facial fovea linear (Fig. 3); mesopleuron without dark ventral spot ..... *holoxantha* Timberlake
   Facial fovea tear-shaped (Fig. 2); mesopleuron with dark ventral spot ..... *multiflorae* Parker



Figures 1–4. Heads of females: 1, *P. wootonae*; 2, *P. multiflorae*; 3, *P. holoxantha*; 4, *P. kiowi*.

Perdita multiflorae Parker, New Species
(Figs. 2, 5, 9)

Holotype female: Length, 5 mm. Yellow except: mandible red apically; basal half of mandible, labrum, lower half of clypeus white; antennal flagellomeres light brown dorsally, flagellomeres II–IV with dark brown transverse marks; large dark brown ventral patch with faint greenish reflections on mesopleuron; hind tarsi tinged with dark brown; facial fovea, posterior margin of median ocellus, mark inside base of hind wing, lateral line of tergum II black; tegula except basally, wing veins except brownish subcosta and stigma clear; tergum VI amber.

Head broader than long (Fig. 2); hair on vertex equal to length of antennal pedicel; facial fovea slightly tear-shaped, angled toward eye dorsally, upper end opposite indention in eye; outer subantennal suture not strongly curved below; line of lateral clypeal suture scarcely interrupted at juncture of outer subantennal suture; mandible with inner subapical tooth; gena in lateral view much narrower than eye, widest point of gena above middle of eye.

Scutum shagreened, shiny; scutal hair short, longest anteriorly where equal to length of pedicel; forecoxa, ventral mesopleuron covered with long, dense, apically hooked hair; forefemur with simple, apically hooked hair on posterior surface;

ventral margin of midfemur forming right angle basally; hindtibia with length of hair on dorsal margin approximately equal to width of segment.

Pygidium with carinate margins, surface flat, strongly shagreened, dull, apex narrowly truncate without medial notch.

Male: Length 4–4 1/2 mm. Color as in female except: lower half of clypeus pale yellow; antennal flagellomeres without dark markings; facial fovea, vertex around ocelli, scutum usually posterolaterally, postaxillary mark, sutures between scutum, scutellum, metanotum, and propodeum, anteriorly expanded V-shaped mark on disc of propodeum dark brown; tergum I basally and apically, often with median longitudinal connecting line, tergum II with lateral line, lateral preapical spot light brown; no black markings; no ventral dark patch on mesopleuron, occasionally indistinct light brown patch; no amber on terga.

Head slightly broader than long; hair on vertex longer than pedicel; facial fovea round to slightly oblong; outer subantennal suture distinctly curved except in macrocephalous individuals; lateral suture of clypeus just beneath juncture of outer subantennal suture oblique, forming low curve with rest of lateral suture; angle on lower gena usually present, acutely tuberculate in macrocephalous individuals.

Scutum highly polished, shagreening indistinct; mesopleuron ventrally with short, dense plumose hair; forefemur not greatly enlarged, length approximately twice width.

Tergum II with linear lateral line scarcely attenuated on the ends; tergum VII broadly rounded apically; sternum VIII as in Fig. 5; genitalia as in Fig. 9.

Variation: Females vary in the extent and darkness of the ventral mesopleural mark; most specimens lack greenish reflections. In some individuals the white portion of the head extends dorsally beyond the lower half of the clypeus.

As is common in this group, males vary greatly in the shape of the head. Macrocephalous individuals have a more quadrate head, the clypeal margin is more pronounced medially, the outer subantennal sutures are not distinctly curved, and the gena is expanded and bears a large posteriorly-directed tubercle below. There do not appear to be discrete classes of individuals; rather, there is a cline in all the above characters. Variation in the degree of dark maculations appears independent of the head structure.

Type Material.—Holotype female: "UTAH Emery Co. 5100′ 2 mi E Little Gilson Bt VIII–24/26–81 Veirs/Griswold/Parker." Paratypes: UTAH, Emery Co.: 33 males, 59 females same data as holotype; 2 males, 14 females, same except from nest, 26–VIII–81; 7 males, 11 females, San Rafael Desert, 5000′–5100′, near Little Gilson Butte, 24/27–VIII–80, A. S. Menke, F. D. Parker, K. A. Menke; 3 females, 1/2 air miles NE Little Gilson Butte, 12–IX–83, Parkers, Griswold; 1 female, Wild Horse Cr., 4900′, N of Goblin Vly., 21–IX–82, F. D. Parker, J. H. Parker; 1 female, Wild Horse Cr., 4800′, W of Goblin Vly., 23–IX–82, F. D. Parker, J. H. Parker; 1 female, 4 air miles N Gilson Butte, 5100′, 12/14–IX–83, Parkers, Griswold. Holotype is in the collection of the U.S. National Museum; paratypes in the AMNH, BBSL, and UK collections.

Additional Material.—UTAH, Wayne County: 1 female, E edge Capitol Reef, 15–IX–79, F. Parker, D. Veirs.

Range.—Known only from the San Rafael Desert and adjacent areas of the Colorado Plateau in Utah.

Discussion.—P. multiflorae coexists with *P. holoxantha* in the San Rafael Desert and both have been collected on *Mentzelia multiflorae* at the same date and location. In addition to the characters given in the key, *P. multiflorae* differs from *P. holoxantha* by the more shiny scutum, in the female by the longer length of the pubescence anteriorly on the scutum, and in the male by the more broadly rounded apical margin of tergum VII.

Perdita kiowi Griswold, New Species
(Figs. 4, 8, 12)

Holotype female: Length, 6 mm. Chalk-white except: mandible red apically; antennal flagellomeres brown dorsally, flagellomeres II–IV with dark brown transverse marks; subantennal sutures, facial fovea, small mark above antennal socket, posterior margin of median ocellus, mark inside base of hind wing, post-axillary mark, scutellar-metanotal suture black; irregular area around lateral ocellus, thin transverse line on pronotum, scutum along margin with tegula and scutellum, metanotal-propodeal suture, small ventral mesopleural spot, lateral line of tergum II dark brown; yellowish cast on scutum, lower mesopleuron; tegula except basally, wing veins except yellowish subcosta and stigma clear; tergum VI light amber.

Head longer than broad (Fig. 4); hair on vertex longer than antennal pedicel; facial fovea long, linear, parallel to inner eye margin, upper end above indentation in eye; outer subantennal suture distinctly arced; lateral clypeal suture distinctly angled at juncture of outer subantennal suture; mandible with inner subapical tooth; gena in lateral view as wide as eye, widest point of gena below middle of eye.

Scutum shagreened, shiny; scutal hair short, longest anteriorly where equal to length of pedicel; forecoxa, ventral mesopleuron covered with long, dense, apically hooked hair; forefemur with simple hair on posterior surface, some hooked apically; ventral margin of midfemur forming right angle basally; hindtibia with length of hair on dorsal margin approximately equal to width of segment.

Pygidium with carinate margins, surface flat, strongly shagreened, dull, apex narrowly truncate with shallow median notch.

Male: Length, 5 mm. Pale yellow except: mandible basally, face below level of antennal bases, pronotal lobe, tegula basally, scutellum, metanotum, subcostal vein, stigma whitish; mandible red apically; posterior margin of median ocellus (rarely expanded to lateral ocellus), mark inside base of hind wing, post-axillary mark black; clypeal and subantennal sutures, facial fovea, irregular area around lateral ocellus, mesopleuron beneath, sutures between scutum, scutellum, metanotum, and propodeum, subalar pit of mesopleuron, propodeum occasionally, median apical fovea of propodeum, lateral mark on tergum II dark brown; mesopleuron ventrally usually without mark or with small, indistinct brown mark, mark infrequently large, dark brown with metallic reflections; tegula except basally, wing veins except subcosta and stigma clear.

Head usually quadrate, length approximately equal to width; hair on vertex much longer than pedicel; facial fovea distinctly oblong; outer subantennal suture nearly straight, without distinct curve; lateral suture of clypeus just beneath juncture of outer subantennal suture vertical, at a distinct angle to rest of lateral suture; angle on lower gena usually present, acutely tuberculate in macrocephalous individuals.

Scutum highly polished, shagreening indistinct; mesopleuron ventrally with long, loose plumose hair; forefemur not greatly enlarged, length approximately twice width.

Tergum II with linear lateral line attenuated on the ends; tergum VII broadly rounded apically; sternum VIII as in Fig. 8; genitalia as in Fig. 12.

Variation: There is considerable variation in the dark markings on the head and thorax of the females. The ventral mesopleural spot varies from nearly absent to occupying the entire ventral surface and is occasionally submetallic, while the facial marks vary in extent and range in color from light brown to black. The population from El Paso County, Colorado contains individuals with much more highly developed dark markings than any other known populations. Some of these females have the frons, vertex, scutum, and propodeum mostly dark green, but we can find no structural differences indicating that these represent a sibling species.

Males vary in the shape of the head as in *P. multiflorae*, but not to the extent found in the latter. Variability in the extent of dark markings is much less pronounced than in females. Some males do have a dark mark surrounding the ocelli.

Type Material.—Holotype female: "USA, Nebraska: Dawes Co., Fort Robinson, VIII–12–1971, collected on *Mentzelia* between 5:30–6:00 P.M., J. G., B. L., and K. C. Rozen collectors." Paratypes: NEBRASKA, 22 males, 21 females, same data as holotype; 7 males, 7 females, same except 11–VIII–71, 7:00–7:45 P.M.; 4 males, 2 females, same except no floral data, 9/11–VII–72, J. G. Rozen, K. C. Rozen, R. McGinley; 7 males, same except R. McGinley; Garden County: 7 females, Oshkosh, 8 miles NE, 12–VIII–55, *Mentzelia*, W. E. LaBerge; 4 females, same except C. W. Rettenmeyer; Keith County: 5 males, 5 females, Cedar Point Biological Station, 1–IX–79, *Mentzelia nuda*, K. H. Keeler; Sheridan County: 1 female, Gordon, 10 miles SE, 9–VIII–55, *Mentzelia,* W. E. LaBerge; Sioux County: 1 male, 13–VIII–06, H. S. Smith; 1 male, Glen, 10–VIII–55, *Mentzelia*, C. W. Rettenmeyer; 1 female, same except 18–VIII–06, M. H. Swenk; 2 females, same except 4000′ *Mentzelia*, no collector; 16 males, 2 females, Glen, 3 miles E, 10–VIII–55, *Mentzelia*, W. E. LaBerge. KANSAS, 29 males, 19 females, Charleston, 5–IX–49, *Mentzelia decapetela*, Michener, Beamer; Barber Co.: 8 males, 11 females, Aetna, 5 miles SSW, 6–VIII–62, *Mentzelia decapetela*, W. B. Kerfoot; Finney Co.: 3 males, 10 females, Garden City, 2 miles S, 3–IX–51, *Mentzelia,* C. D. Michener, W. E. LaBerge; Hamilton Co.: 1 male, Syracuse, 22–VII–50, *Mentzelia decapetela*, C. D. Michener; Scott Co.: 1 male, 1 female, State Park, 8–VIII–64, C. D. Michener. Holotype is in the collection of the American Museum of Natural History, paratypes in the collections of AMNH, INHS, UCM, UK, and BBSL.

Additional Material.—COLORADO, 1 female, Denver, 29–VII–22, *Eriogonum effusum*, L. O. Jackson; Bent County: 8 males, 8 females, Caddoa, 2–VIII–57, *Mentzelia*, C. D. Michener; 1 male, Clay Ranch Gate, 8–VIII–57, *Mentzelia*, H. G. Rodeck; 6 males, 1 female, Hasty, 2 miles S, 12–VIII–74, U. N. Lanham; El Paso County: 2 males, 2 females, Foster Ranch, T15S R65W Sec. 22 NE/4, 6–VIII–77, *Mentzelia*; 2 males, 12 females, same except 7–VIII–77; 1 male, same except 12–VIII–77. TEXAS, 5 males, 3 females, 7 miles E Memphis, 5–IX–63, *Mentzelia*, G E. Bohart; Crosby County: 2 females, Cap Rock, 9 miles E, 29–VII–76, *Mentzelia nuda*; Lipscomb County: 2 females, Higgins, 18–IX–70, *Mentzelia nuda*, Baker, Kamm, Michener; Mitchell County: 1 female, Tex. Rd. 670, 22–VII–76, *Mentzelia*

nuda. NEW MEXICO, Roosevelt County: 11 males, 2 females, Oasis State Park, near Portales, 18–IX–70, *Mentzelia nuda*, Baker, Kamm, Michener. Specimens are in the BBSL, LACM, and UK collections.

Range.—Found on the Great Plains from Nebraska to Texas and New Mexico. All the records under *P. wootonae* given by Timberlake (1962) apparently belong here. This is the most distinctive species of the group. In addition to the characters in the key, the female differs from females of the other three species in this group in the greatly elongate facial foveae and the more strongly angled dorsolateral margin of the clypeus. It further differs from *P. multiflorae* and *P. holoxantha* in being off-white rather than pale yellow.

Perdita wootonae **Cockerell**

(Figs. 1, 6, 10)

Perdita wootonae Cockerell, 1898. Entomol. News 9:215. (Holotype female: Tularosa, New Mexico; ANSP.)

Perdita viridinotata Timberlake, 1962. Univ. Calif. Pubs. Entomol. 28:16. (Holotype female: Alamogordo, Otero Co., New Mexico; CAS.) New Synonymy.

Systematics.—Study of the types of *P. wootonae* and *P. viridinotata* showed them to be the same species. It appears that Timberlake never examined the type of *P. wootonae*. The description of *P. wootonae* given by Timberlake (1962), as well as all the records included, are referrable to *P. kiowi*.

Range.—Known only from Otero County, New Mexico. All localities are from the vicinity of White Sands.

New Records.—NEW MEXICO, Otero County: 2 males, 1 female, White Sands Monument area, 4000′, 9–IX–62, H. A. Scullen; 5 males, 16 females, White Sands Natl. Mon., 20–VIII–62, *Chrysothamnus* sp., H. V. Weems, Jr. Specimens are in the CAS, FSC, UCR, and BBSL collections.

Perdita holoxantha **Timberlake**

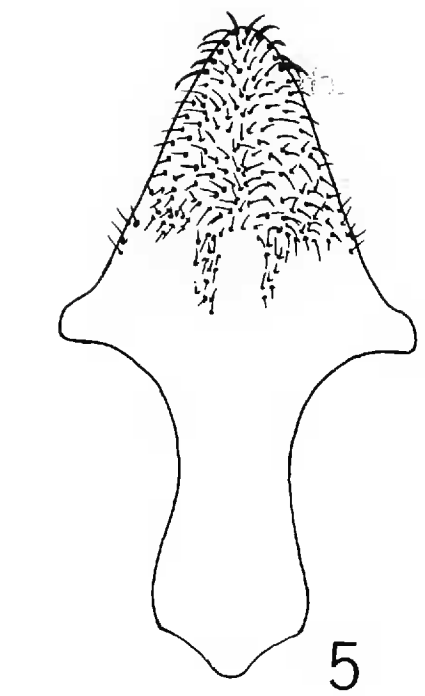
(Figs. 3, 7, 11)

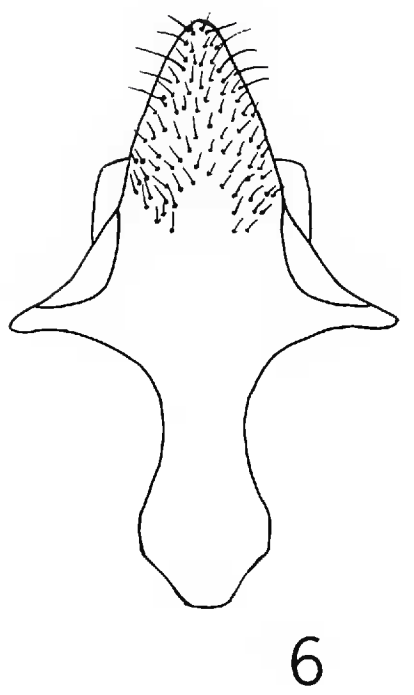
Perdita holoxantha Timberlake, 1962. Univ. Calif. Pubs. Entomol. 28:17. (Holotype male: St. George, Washington County, UTAH; AMNH.)

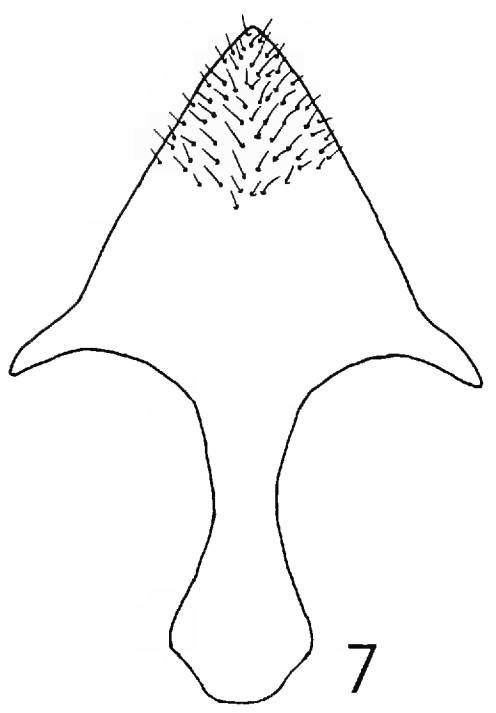
Systematics.—This species is closely related to *P. multiflorae*. (For a discussion of the two, see the latter.) It is possible that two species are included under *P. holoxantha*. Males from Washington County, Utah (the type locality) and adjacent Clark County, Nevada have a more broadly rounded seventh tergum than males from the Colorado Plateau. There are no females from the type locality, but a single female from Clark County, Nevada appears to differ slightly from more eastern specimens in the shape of the facial fovea and in the shape of the head. Additional specimens are needed to determine if these differences are significant.

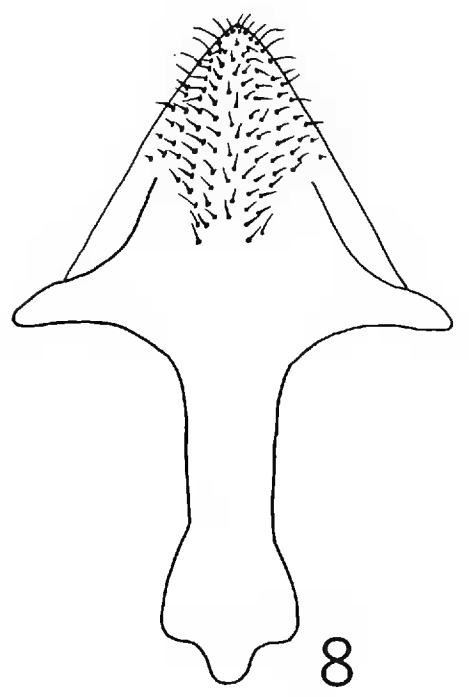
Range.—Known from southern Nevada, southern Utah, northern Arizona and New Mexico. One of the female paratypes of *P. viridinotata* is actually *P. holoxantha*.

New Records.—ARIZONA, Coconino County: 1 female, Cameron, 9–VI–77, R. C. Miller. NEVADA, Clark County: 5 males, 1 female, Riverside, 11/21–V–83, F. D., J. H. Parker. NEW MEXICO, Otero County: 1 female, Alamogordo, 13–IX–37, R. H. Crandall. UTAH, Emery County: 5 males, 33 females, 2 miles E Little Gilson Butte, 5100′, 24/26–VIII–81, Veirs, Griswold, Parker; 6 males, 10



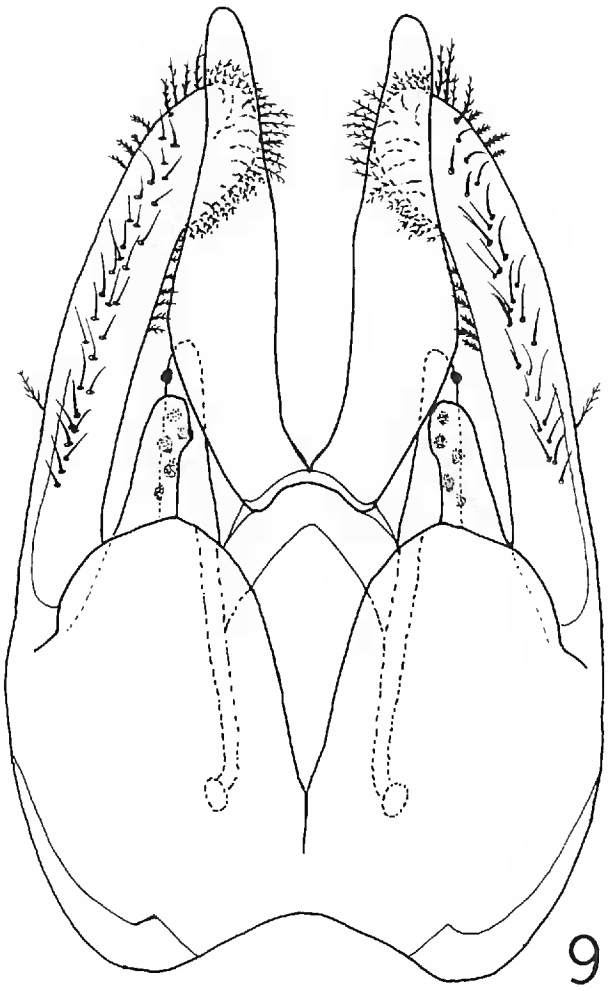


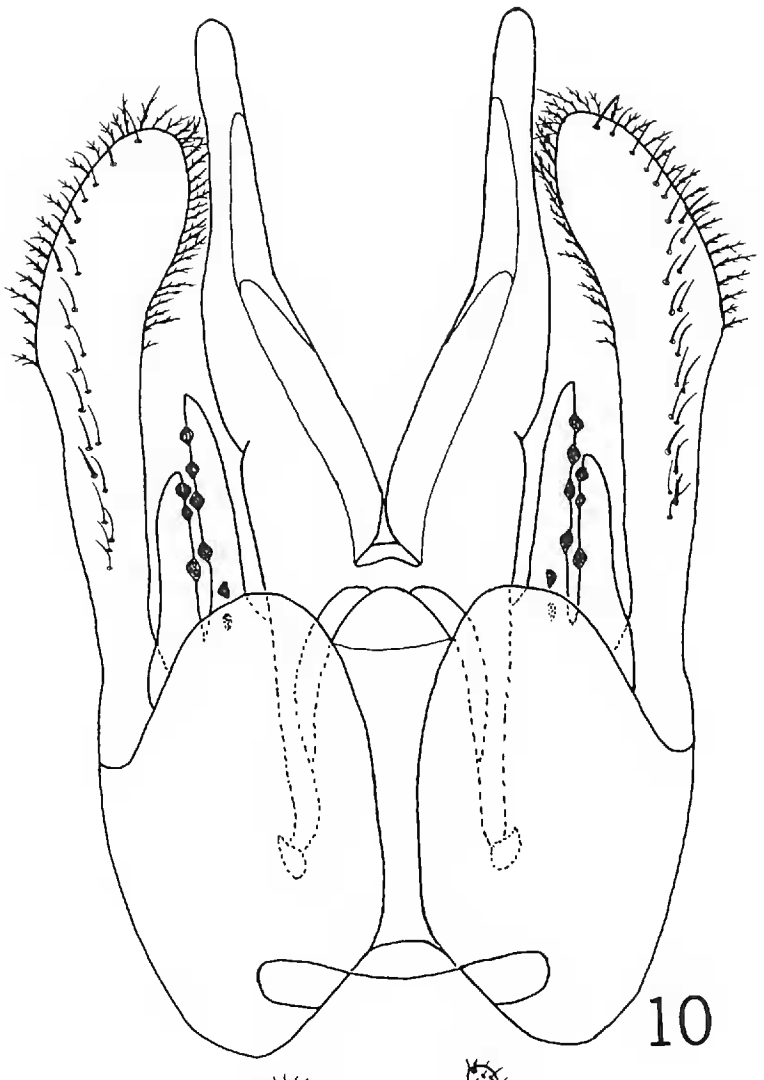


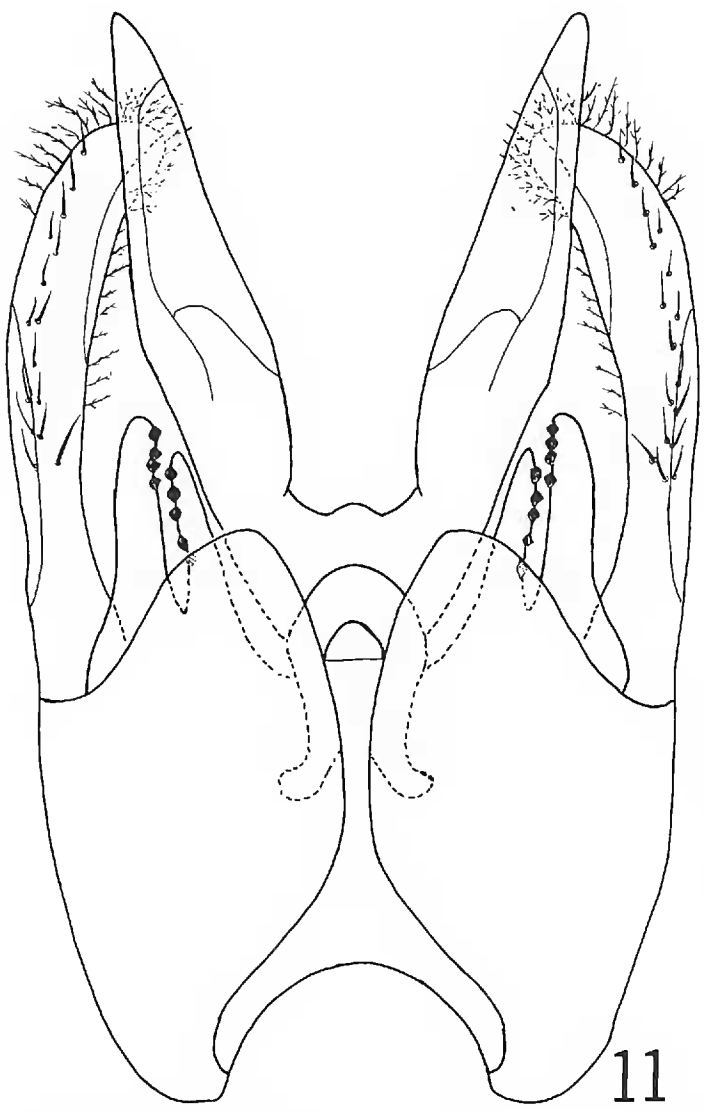


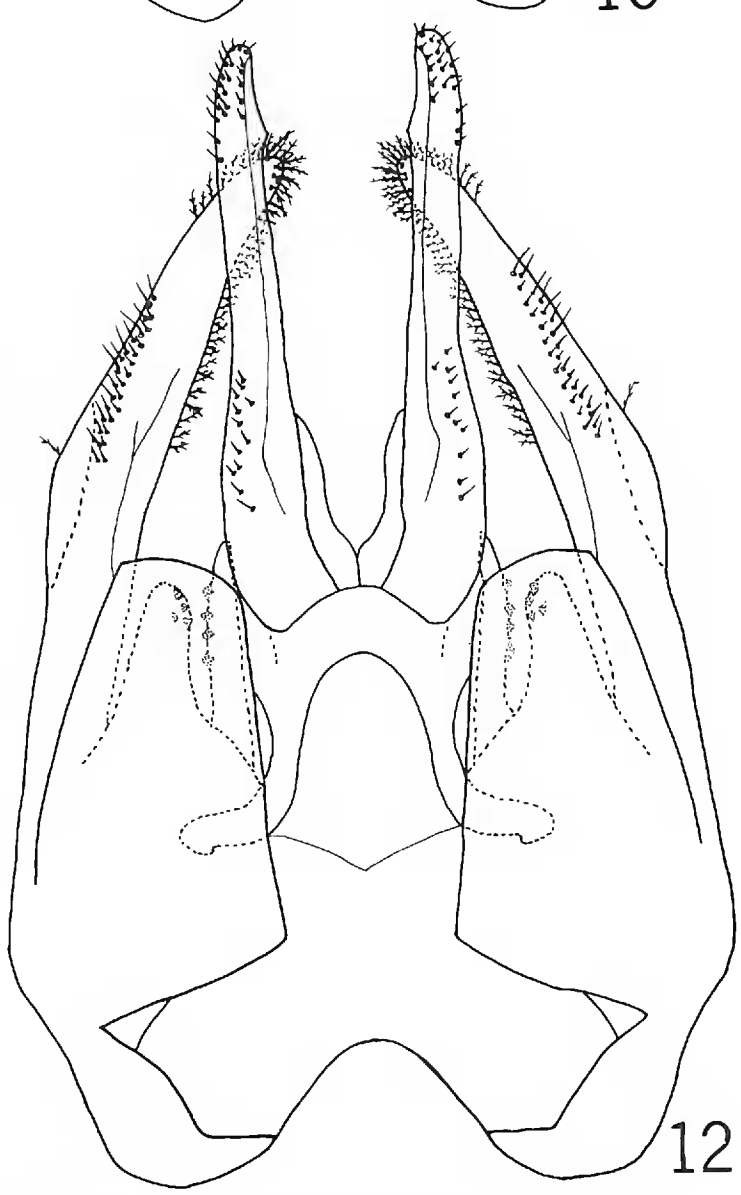
Figures 5–8. Male eighth sterna: 5, *P. multiflorae*; 6, *P. wootonae*; 7, *P. holoxantha*; 8, *P. kiowi.*

females, same except 15/17–IX–80, T. Griswold; 15 males, 21 females, San Rafael Desert, near Little Gilson Butte, 5000′–5100′, A. S. Menke, F. D. Parker, K. A. Menke; 2 females, 1/2 air miles NE Little Gilson Butte, 12–IX–83, Parkers, Griswold; 1 male, 2 females, Wild Horse Cr., N of Goblin Vly., 4900′, 23–IX–82, F. D. Parker, J. H. Parker; 7 males, 1 female, same except 3–VI–82, Parker, Griswold; 2 males, same except 14–VI–83, F. D. Parker, J. H. Parker; 2 males, 6 females, same except 21/23–VII–81, Veirs, Parker, Griswold; 1 female, same except 25/28–VII–83, Parkers, Griswold; 2 males, Buckskin Spr., N of Goblin Vly., 5150', 25–VIII–81, Parker, Veirs, Griswold; 1 male, 3.2 air miles NE Little Gilson Butte, 14–VI–83, F. D. Parker, J. H. Parker; 1 male, 1 female, 1 1/2 miles NE Little Gilson Butte, 23–VII–81, Parker, Veirs, Griswold; 1 male, Goblin Vly., sand dunes, 20–VI–80, F. D. Parker; Garfield County: 1 male, 7 females, Cane Springs Desert,









Figures 9–12. Male genitalia: 9, *P. multiflorae*; 10, *P. wootonae*; 11, *P. holoxantha*; 12, *P. kiowi.*

10 miles N Bullfrog, 4000′, 16–VI–83, T. Griswold; San Juan County: 3 females, Monument Valley, 7–VIII–69, T. Griswold; Washington County: 4 males, Santa Clara, 30–V–73, *Mentzelia*, F. Parker, P. Torchio. Specimens recorded here are in the UCD and BBSL collections.

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Illustrations of the female heads were prepared by Q. Truong; those of the male sterna and genitalia by D. Broemeling.

Literature Cited

Timberlake, P. H. 1962. A revisional study of the bees of the genus, *Perdita* F. Smith, with special reference to the fauna of the Pacific Coast. Part V. Univ. Calif. Pubs. Entomol. 28:1–123.